

Artificial Intelligence. الذكاء الاصطناعي

Lee : 1

✓ What is AI ?

The science of making machines that : correctly (no mistakes)

1. Think like people.

• Think rationally يفكر بقلانية

2. Act like people.

• Act rationally يتصرف بقلانية

✓ AI \equiv Computational Rationality.

✓ We want to make a machine think and act like human as it can do the same thing the human can do more perfectly.

✓ We can make this machine (computer) by training it to do what I want \rightarrow we depend on its memory and then we test it.

✓ Training \rightarrow (a) Software training (b) hardware training

✓ at First we should know exactly what we want the machine to do
(ex) we want to make a machine can play Football.

Then we study the behavior of the Football players and train our machine to do the same thing by saving all the information that it will need to play Football in its memory. using IF statement for example
We test the machine to be sure that there is no error.

✓ IF we don't train it correctly, we find more errors

✓ Be sure that the human is more intelligent than the machine.

✓ In the case that the machine has more information than the person who play with it. It can win but we will still say the human is more intelligent

✓ Note : The machine can't think or act all the human behavior. ex: the machine can't be able to write stories as the machine depends on the person who make it.

✓ Anything the machine can be able to do can be called Machine learning OR Artificial Intelligence whenever it do it perfectly or not.

✓ Know that we must test the machine by the same thing we training it to do (ex) we make a machine playing Football and train it to play Football well when we want to test it we must play Football with it not to play any game else.

Rational Decisions

✓ The machine can act and think like human and Choose the Optimal Solution (shortest pass)
it can choose the best way to do anything but human can choose the way. IF the human can choose the best way depending on scientific study, he will need more time than the machine as he will waste more time but it will act very fast.

Maximize Your Expected Utility

- ✓ We need the machine that can choose the shortest pass.
- ✓ We need to get the best way to do anything.
- ✓ The thing we need to get the best way to do it can be called a problem.
- ✓ We can describe the problem by its objective function.
- ✓ We use the inputs of the problem and the outputs (what I want) to create the problem objective function.
- ✓ We maximize or minimize the objective function depending on the wanted output. ex: IF we have an objective function (describes the error of any system) then we will need to minimize this objective function.
- ✓ So The AI has a big part of mathematical models

- ✓ Depending on the inputs we have, we can determine what we want to get OR we can make a decision.
- ✓ We can know the output of the machine (know the decision that it will make) as we are its trainer but we can't know the human decision example: we design a machine playing Football. When football players team play with it, they can note its behaviour and win but when this team play with another football player team they can't know their behavior.
- What about the Brain?
- ✓ Finally the human can ^{استعار}innovate but the computer can't.
- ✓ The human mind can get innovated decisions or unexpected but it can't find optimal solution.
- ✓ The computer can get ^{بـ}optimal solution to solve any problem but it can't get innovated decisions or unexpected ones.

✓ The computer can get optimal solution depending on its history because of its strong memory

A (Short) History of AI

- Early days
 - 1943 : Start thinking of AI (Machine learning)
 - 1950 : Start thinking about how to train machines
 - 1950 — 70 : Excitement : look, Ma, no hands.
 - Start getting all the information needed and thinking how to use it
- 1970 — 90 : Knowledge-based approaches
 - They discovered that they have only knowledge can't be used so they thought that is the AI Final and called it AI Autumn

AI خريف

- 1990 — : Statistical approaches.
- They Study How the human act
- From 60's to 80's they work on Knowledge-based that used in many Fields like Industry, Space, learning ... by manage this Knowledge correctly.
- They use the 2 Sciences to make Artificial Intelligent model.
- This is called "AI Spring" ^{ربيع AI}
- Agents and learning systems appear

Note: Agents : not only just a training machine can do the things that it was trained on, but also I want it to be able to do thinks I don't train it to do (this is the new science)

Agents —→ Multi-System agents
 —→ Uni-System agents.

⇒ What Can AI Do ?

- Make a machine playing Games
- Make a machine driving Cars
- Make a machine buying From web
- but can't make a machine buying good things From a market like human.
- Can't make a machine writting stories.

⇒ AI Applications:

□ Natural Language.

- Speech technologies.

- Automatic speech recognition (ex: entering by Voice tag) ^{الدخول}
- Text-to-Speech synthesis (read texts by high Voice)
- Dialog Systems

- Language processing technologies
 - . Question Answering
 - . Machine translation
 - . Web Search
 - . Text Classification, spam Filtering -- etc.
- Object and Face recognition
- Scene Segmentation
- Image Classification.

Robotics

- . RoboCup
- . Show slides

Logic Systems.

- Theorem provers
- NASA Fault diagnosis
- Question answering

Methods

- Deduction Systems
- Constraint Satisfaction
- Satisfiability Solver (huge advances!)

Game Playing (Deep Blue)

Decision Making

Designing Rational Agents

have been explained

Making A Decision Keys:

To make a good prediction.

1. Memory: by remembering what did you do in the past
(IF it was bad or good)
2. Simulation: having a model of the world thinking through a chain of consequences in a simulated model.

Course Topics:

I - Reasoning under Uncertainty

- Machine Learning
- Expert Systems

II - Making Decisions

- Search techniques
- Decision Theory

III - Throughout : Applications

- Natural Language, Computer Vision, robotics, games ...